Nuclear Technology: Harder, Better, Faster, Stronger

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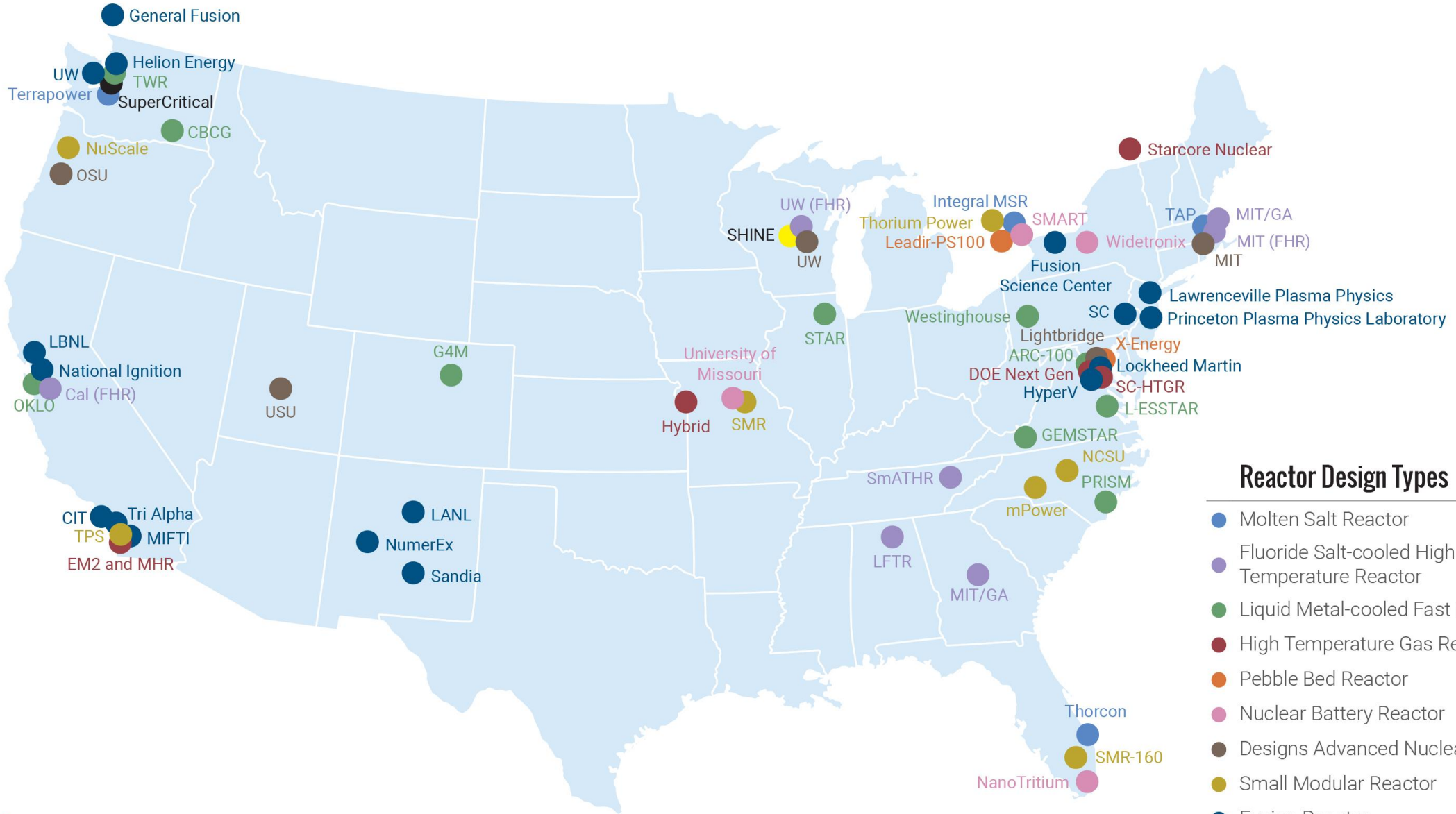
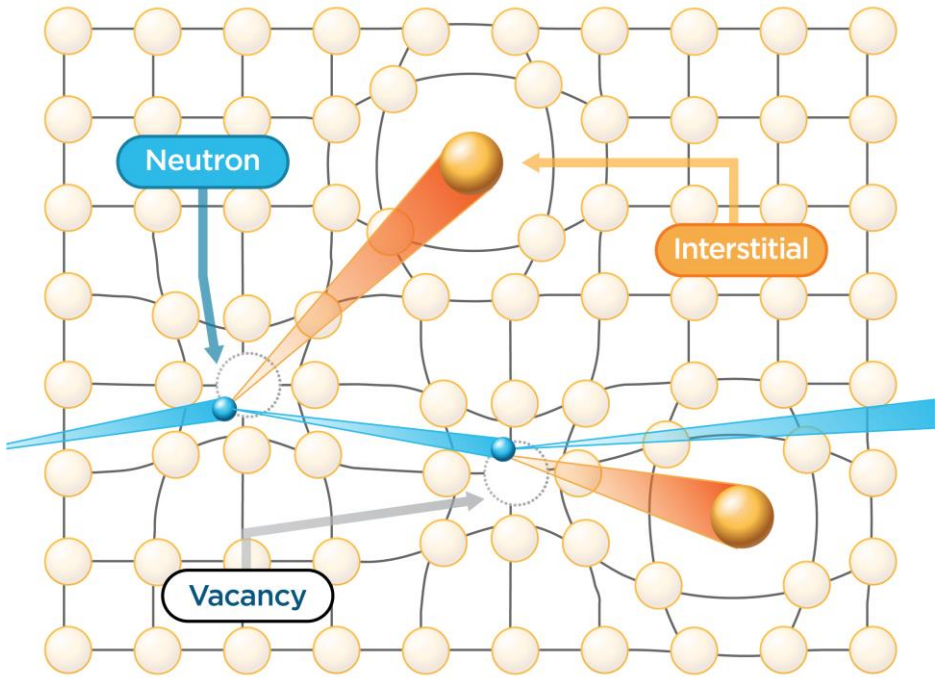
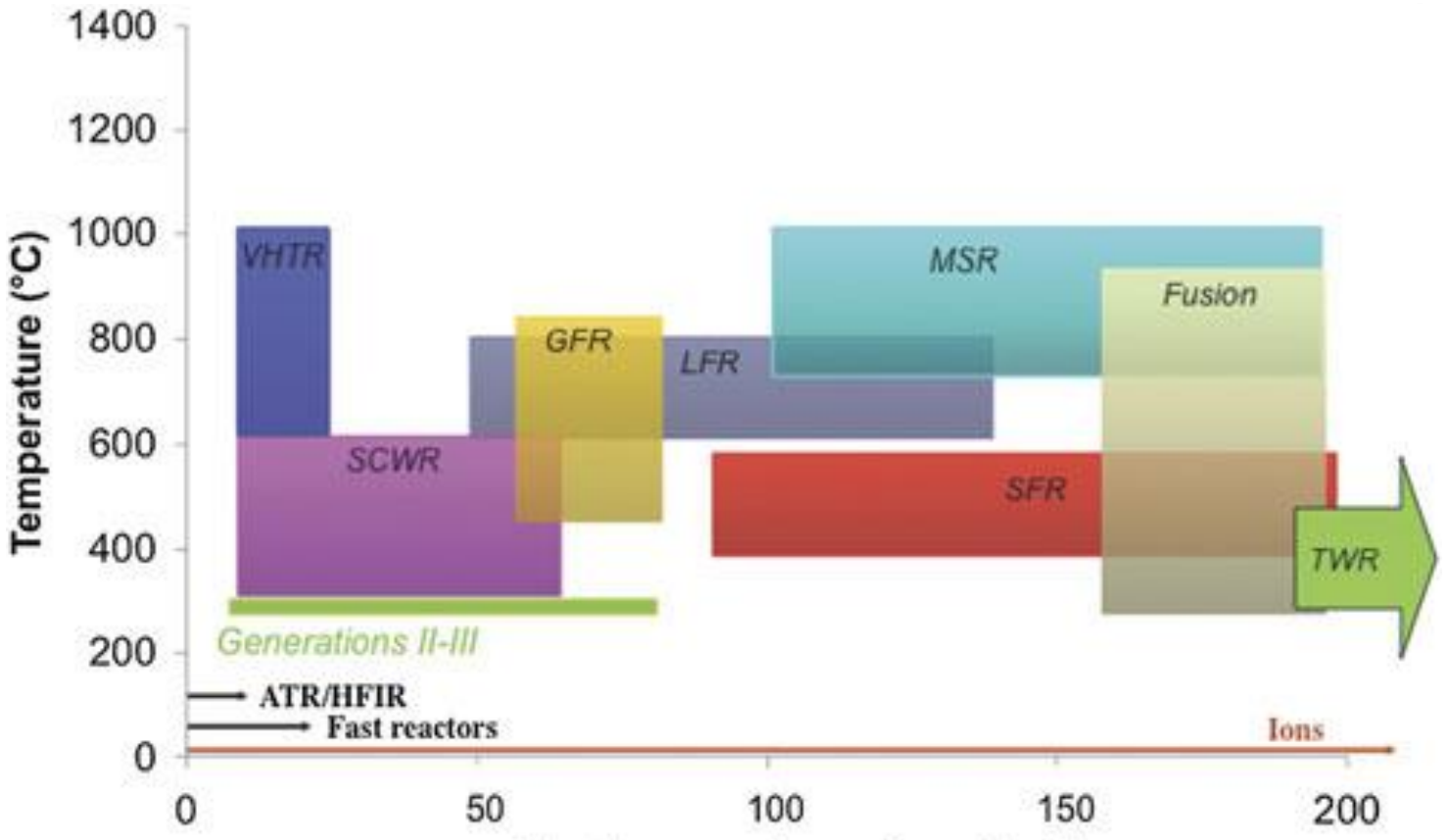


Reactor Design Types

- Molten Salt Reactor
- Fluoride Salt-cooled High Temperature Reactor
- Liquid Metal-cooled Fast Reactor
- High Temperature Gas Reactor
- Pebble Bed Reactor
- Nuclear Battery Reactor
- Designs Advanced Nuclear Fuels
- Small Modular Reactor
- Fusion Reactor
- Super-Critical CO_2 Reactor
- Accelerator Driven System

Work It: New Tech Needed for The Future

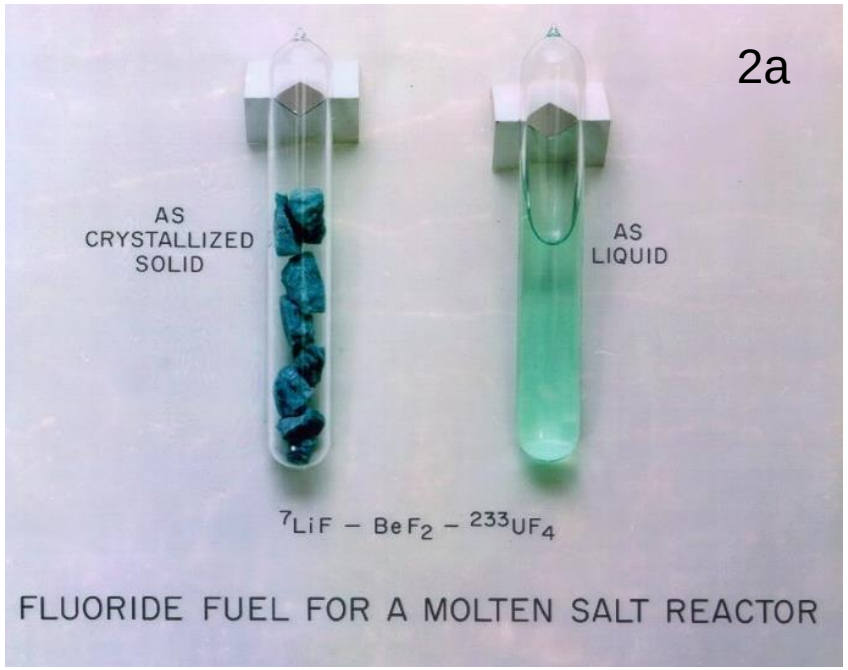


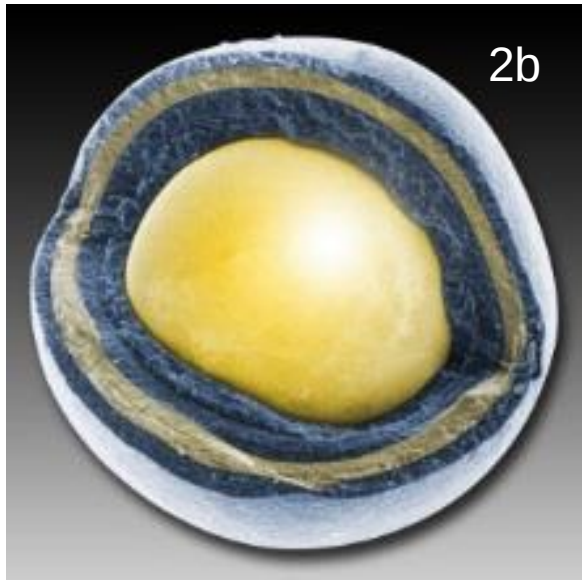


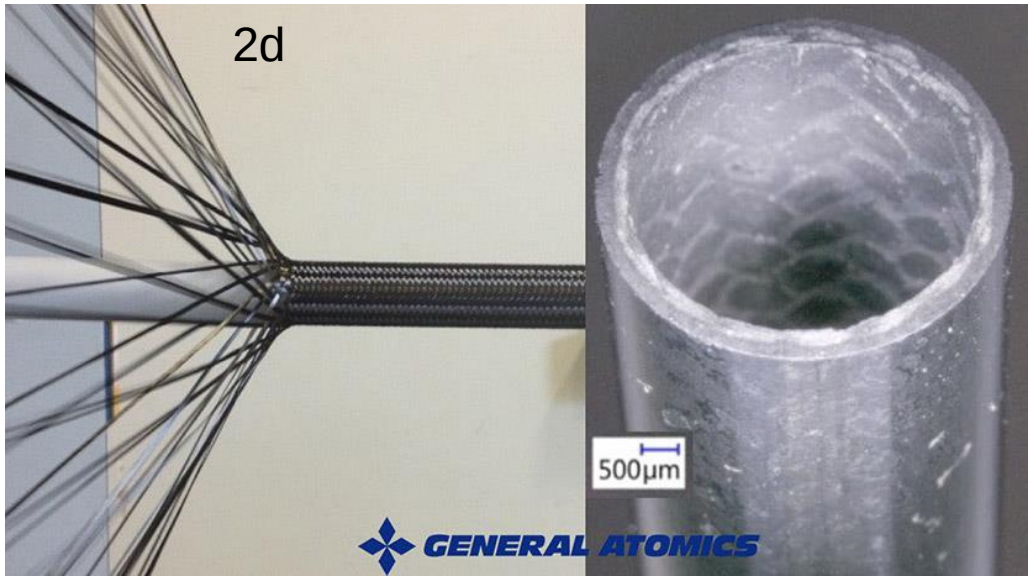
Material Damage

Was, Gary S. "Challenges to the use of ion irradiation for emulating reactor irradiation." Journal of Materials Research 30.9 (2015): 1158-1182.

Make It: New Fuels and Materials for Better Performance





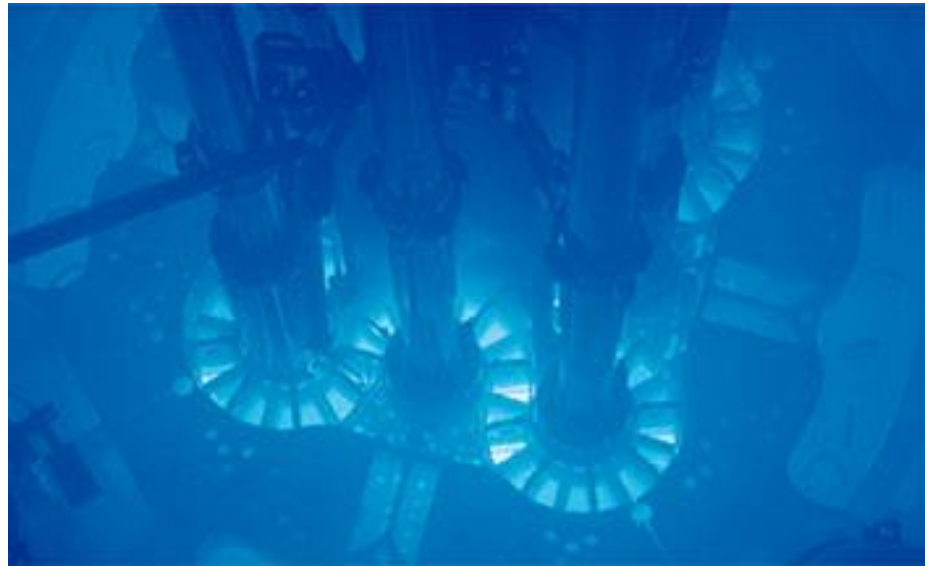


2a: https://public.ornl.gov/conferences/MSR2016/
2b: https://atomicinsights.com/advances-high-temperature-nuclear-reactor-fuel-triso-integrity-1800-c/
2c: https://www.technologyreview.com/s/601121/this-new-fuel-could-make-nuclear-power-safer-and-cheaper/
2d: http://www.ga.com/accident-tolerant-fuel

Do It?

Few test facilities in the world

- That aren't always available
- And may not have large test spaces
- With varying operational conditions



Time and Cost of New Reactor Development

Corradini, Michael. "DOE Advanced Test and Demonstration Reactor Options." Presentation to SEAB. Washington, DC. March 23, 2016.

What If We Changed How We Do Experiments?

E.g.: I want to qualify Vibranium for use as a structural material:

Now

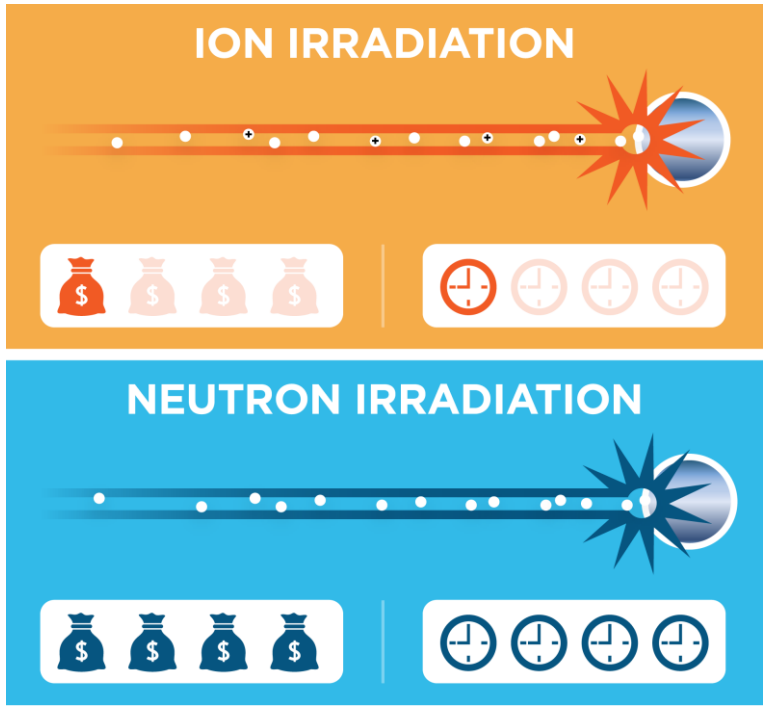
- 3 unique samples/variations
- 10 years
- $10 000 000
- Stuck with operational conditions
- Limited to direct measurement of bulk properties/behavior

What If?

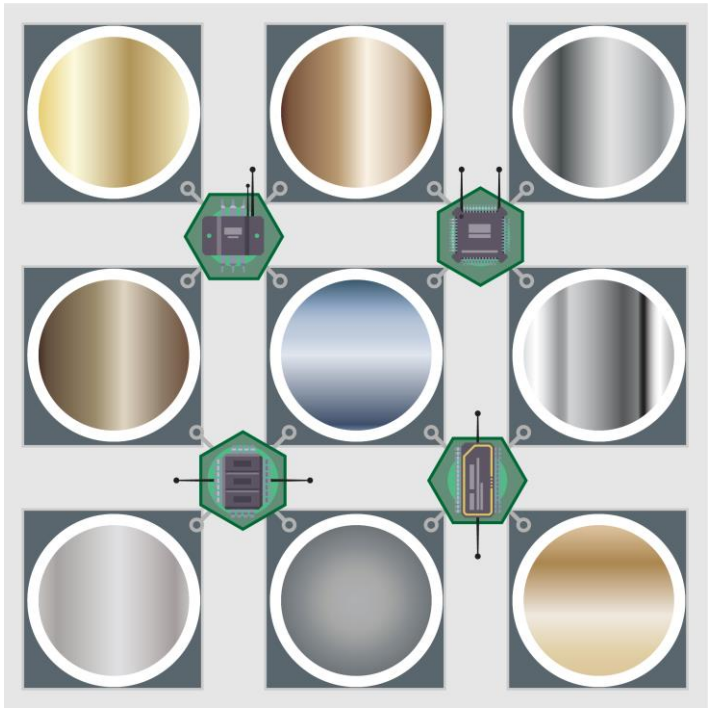
- 30 unique samples/variations
- 10 months
- $10 000
- Known operational conditions
- Measurement of very small samples is enough

Make Us Harder, Better, Faster, Stronger

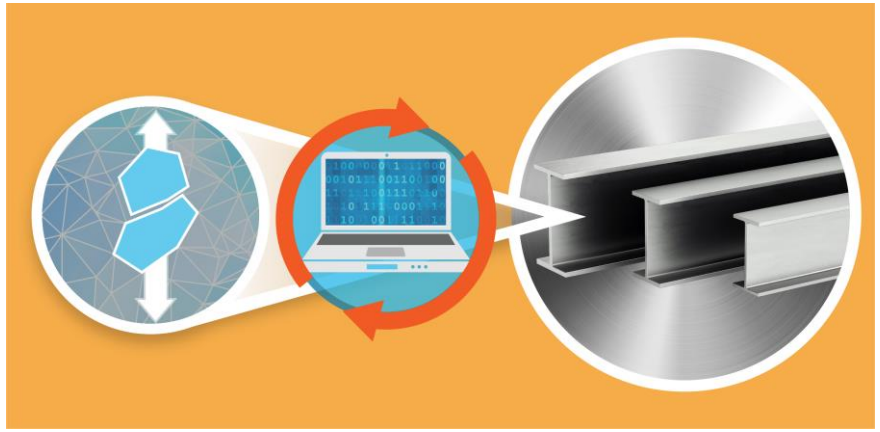
Leverage **proxies and surrogates** to avoid slow- and low-access experiments



Parallelize experiments: additive manufacturing, & advanced sensoring



Improve models of how very physically small experiments map quantitatively into bulk properties




We want to hear from you!